

that may be met may include a determination that alpha radio unit 405 is not handling any emergency calls.

[0050] At step 520 and in response to determining that the second radio unit can feasibly handle servicing both the sector associated with it and the sector of the first radio unit, the MIMO or cyclic delay diversity (CDD) configuration in the second radio unit may be disabled. Continuing the example depicted in FIG. 4, the MIMO or CDD configuration of alpha radio unit 405 may be disabled. For example, if alpha radio unit 405 was initially operating as a MIMO unit, then alpha radio unit 405 may be transitioned to a SIMO or SISO unit. Doing so will free up antenna ports that are not used when alpha radio unit 405 operates with a single transmitter and receiver.

[0051] At step 525, the CDD or MIMO radio ports that were previously used for transmitting in the second radio sector may be reconfigured to transmit in the first radio sector. Stated differently, radio unit link points may be established between the available radio ports of the second radio unit and an antenna unit associated with the first radio sector. Thus, the ports that were freed up when the MIMO configuration was disabled in alpha radio node 405 may be linked to the beta antenna unit 445. In this manner, alpha radio unit 405 may be lent to beta sector 420 and wireless device coverage may be restored to beta sector 420 with minimum loss.

[0052] The lending of services by alpha radio unit 405 may continue until faulty beta radio unit 415 is replaced and service restored. The redundancy provided by alpha radio unit 405 may increase cell availability and reduce power consumption if alpha radio unit 405 is operating in a load balancing mode. Additionally, the method may help to avoid single point failure, by preventing loss of sector coverage in the case of a faulty radio unit and allows the faulty radio unit to be replaced during off-peak hours.

[0053] It may be recognized that while the beta radio unit 415 is being identified and alpha radio unit 405 is reconfigured to provide service to beta sector 420, there may be brief period of downtime in alpha and beta sectors 410 and 420. The downtime may be associated with the amount of time required for the SON algorithm to generate the new configuration and apply the switch settings. Wireless devices 110 that are served by alpha radio unit 405 may suffer radio frequency signal loss for a brief time. Though the signal loss may last only a fraction of seconds, it may result in Radio Link Failure (RLF) in wireless devices 110 in the alpha and beta sectors 410 and 420. Additionally, the event may trigger an RRC connection Re-establishment request. However, the event may be avoided or the effects thereof reduced by changing certain timing parameters as determined by the SON algorithm or as defined by a user. The timing parameters may be optimized based on Quality of Service (QoS) requirement levels that must be maintained for connected wireless devices 110. In a particular example embodiment, the System Information Block Type 2 parameter comprising the t310 timer value to 2000 ms and a n310 value to n20.

[0054] The above described method described using resource sharing to prevent wireless coverage loss as a result of hardware failure in a radio unit array 210. However, it may be desirable to operate a radio unit array 210 in a resource sharing mode even where no failure has been detected. Accordingly, in certain embodiments, a network node 115 may be additionally or alternatively configured to automatically transition to a resource sharing mode when traffic is sufficiently low to render operation of at least one radio unit

unnecessary. Doing so may result in the disabling of one or more radio units, which may result in substantial energy savings over a network node in which all radio units are operating in normal mode.

[0055] The transition from normal operating mode to a resource sharing mode, which may also be considered an energy saving mode, may be selected by an optimized SON algorithm that operates to determine that a network node 115 is not operating efficiently and adjust the configuration of the network node 115 accordingly. For example, in certain embodiments, the optimized SON algorithm may determine that one or more radio units is at no or low load conditions and then reconfigure the radio unit array 210. FIG. 6 is a flow chart illustrating an example embodiment of a method for enabling resource sharing to reduce energy consumption.

[0056] The method begins at step 605 when it is determined that Physical Resource Block (PRB) utilization by a first radio unit 260 is less than a first predefined threshold. In a particular embodiment, PRB utilization may include the sum of the total number of physical resource block (PRB) pairs used for data radio bearers in the downlink (pmPrbUsed-DlDlch) and the total number of PRB pairs used for data radio bearers in the uplink (pmPrbUsed-UlDlch). The pmPrbUsed-DlDlch measurement may be applicable to the Dedicated Traffic Channel (DTCH) on the Physical Downlink Shared Channel (PDSCH). Conversely, the pmPrbUsed-UlDlch measurement may be applicable to the DTCH on the Physical Uplink Shared Channel (PUSCH). In certain embodiments, the first predefined threshold may be thirty percent. Thus, it may be determined that PRB utilization is less than thirty percent. However, it is generally recognized that the first predefined threshold may be a user-selected value that varies as is appropriate.

[0057] At step 610, it is determined that the first radio unit 260 is operating with a MIMO configuration. It is then determined at step 615 that the number of active wireless devices 110 being serviced by the first radio unit 260 is less than a second predefined threshold at step 615. In a particular embodiment, processor 220 may include a counter for determining the number of wireless devices 110 being actively serviced in both the downlink and uplink directions. Specifically, a counter may aggregate for each TTI, the number of wireless devices in the downlink direction with DRB data to send. Likewise, the counter may aggregate for each TTI the number of wireless devices 110 with buffer status reports indicating DRB data to be sent in the uplink direction. Processor 220 may then sum the number of wireless devices 110 considered active in the downlink direction (pmActiveUe-DlSum) and the number of wireless devices considered active in the uplink direction (pmActiveUe-UlSum) and determine if the sum is less than the second predefined threshold. In a particular embodiment, the determination may require that the sum of pmActiveUe-DlSum and pmActiveUe-UlSum is equal to zero, indicating that the cell sector is under a no load condition.

[0058] In some embodiments, the determination requires that the number of active wireless devices 110 is maintained below the second predefined threshold for a predetermined interval of time. Thus, in a particular embodiment, a determination must be made that the PRB utilization is less than the second predefined threshold for at least fifteen minutes. However, it is generally recognized that the predefined threshold